

# HAWAII PRECIPITATION FREQUENCY PROJECT

Update of *Technical Paper No. 43*

Seventeenth Progress Report  
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Hydrology Laboratory

Office of Hydrologic Development  
U.S. National Weather Service  
National Oceanic and Atmospheric Administration  
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## DISCLAIMER

The data and information presented in this report are provided only to demonstrate current progress on the various technical tasks associated with this project. Values presented herein are NOT intended for any other use beyond the scope of this progress report. Anyone using any data or information presented in this report for any purpose other than for what it was intended does so at their own risk.

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# HAWAII PRECIPITATION FREQUENCY PROJECT

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## 1. Introduction

The Hydrometeorological Design Studies Center (HDSC), Hydrology Laboratory, Office of Hydrologic Development of NOAA's National Weather Service plans to update its precipitation frequency estimates for Hawaii. Current precipitation frequency estimates for Hawaii are contained in *Technical Paper No. 43*, "Rainfall-Frequency Atlas of the Hawaiian Islands for Areas to 200 Square Miles, Durations to 24 Hours, and Return Periods from 1 to 100 Years" (U.S. Weather Bureau 1962). The update includes collecting data and performing quality control, compiling and formatting datasets for analyses, selecting applicable frequency distributions and fitting techniques, analyzing data, mapping and preparing reports and other documentation.

The Project will determine annual precipitation frequencies for durations from 5 minutes to 60 days, for average recurrence intervals from 1 to 1,000 years. The Project will review and process rainfall data for the Project area and use accepted statistical methods. The Project results will be published as a Volume of NOAA Atlas 14 on the internet (<http://www.nws.noaa.gov/ohd/hdsc>) using web pages with the ability to download digital files.

The Project area covers the Hawaiian Islands including Hawaii, Maui, Lanai, Molokai, Oahu, and Kauai. The Project area including preliminary regions is shown in Figure 1.

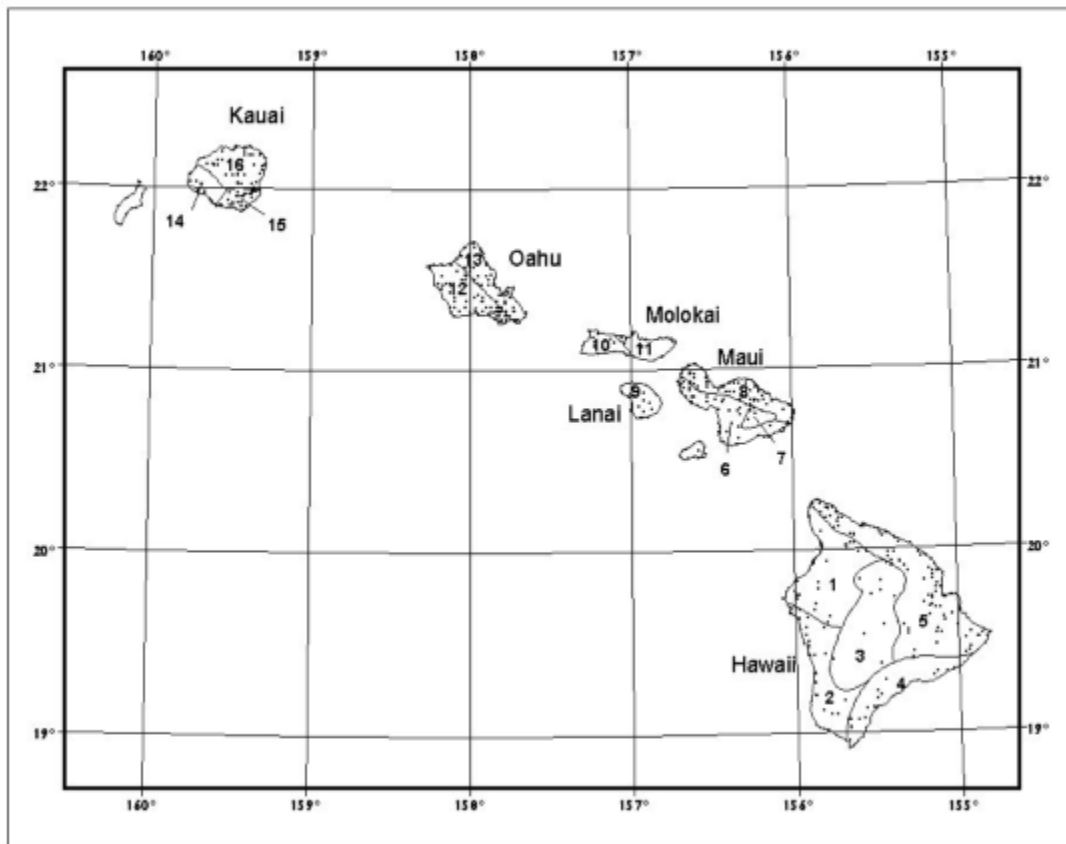


Figure 1. Hawaii Precipitation Frequency Project area, regional divisions and daily station locations.

## 2. Highlights

Funding has become available for Fiscal Year 2005 (FY05) and therefore it is anticipated that we will be able to start on the Hawaii Precipitation Frequency Project in August 2005. Additional information can be found in Section 4.1, Funding Becomes Available for FY05 and Section 5, Projected Schedule and Remaining Tasks.

Some highlights discussed below are lessons learned from the Puerto Rico and Virgin Islands project and the Ohio River Basin and Surrounding States project and therefore are relevant to this project.

QCseries, software that screens annual maximum series (AMS) and partial duration series (PDS) to identify maximum precipitation values that are suspect relative to concurrent data at nearby stations, is being optimized for use with longer duration data quality control. Additional information is provided in Section 3.1, Software Updates.

The Precipitation Frequency Data Server (PFDS), the on-line portal for all NOAA Atlas 14 deliverables and information, underwent several changes. Additional information is provided in Section 3.2, PFDS.

Progress on the development of areal reduction factors remains slow. Additional difficulties have been encountered in modifying the software to add the analysis of 30-minute and 48-hour durations. Two statistical procedures that will be used to test the differences between the ARF curves generated from the various sites have been applied to the data of two sites. Additional information is provided in Section 3.3, Areal Reduction Factors.

### 3. Progress in this Reporting Period

#### 3.1 Software Updates

Additional software has been written to improve the efficiency and effectiveness of the data quality control process. The new spatially-based quality control procedure, known as *QCseries*, continued to undergo development, testing and implementation. *QCseries* screens data to identify precipitation values that are suspect relative to concurrent data at nearby stations. Modifications are being made to make the quality control process more efficient by utilizing previously quality controlled data when evaluating longer durations. Code has been added to *QCseries* to cross-reference the events in the output log file of longer durations with:

1. a list of previously quality controlled 24-hour extreme events above a certain threshold,
2. the previous duration annual maximum (AMS) or partial duration (PDS) series events, whichever the case may be,
3. the same duration AMS or PDS events.

These flags will indicate when a longer duration contains a 24-hour event that has already been quality controlled or if an event was included in other AMS or PDS that may have been quality controlled. Additionally, a new objectively-computed measure of the consistency of the value in question was added in the output log file. This measure is based on the concurrent precipitation at nearby stations and the deviation from spatially distributed values of percent of mean annual precipitation.

#### 3.2 PFDS

The Precipitation Frequency Data Server (PFDS), the on-line portal for all NOAA Atlas 14 deliverables and information, underwent a few changes. The most significant change was on the "NOAA Atlas 14 Temporal Distributions" page, where users can now download the data (as comma-delimited files) used to plot the temporal distribution graphs in the NOAA Atlas 14 documentation (Appendix A.1).

HDSC continuously monitors the hits, integrity and performance of the PFDS, which continues to receive an increasing number of hits per month. The graph (Figure 2) below summarizes the number of individual data inquiries made since January 2004, while the map (Figure 3) indicates the locations of inquiries during the past quarter.

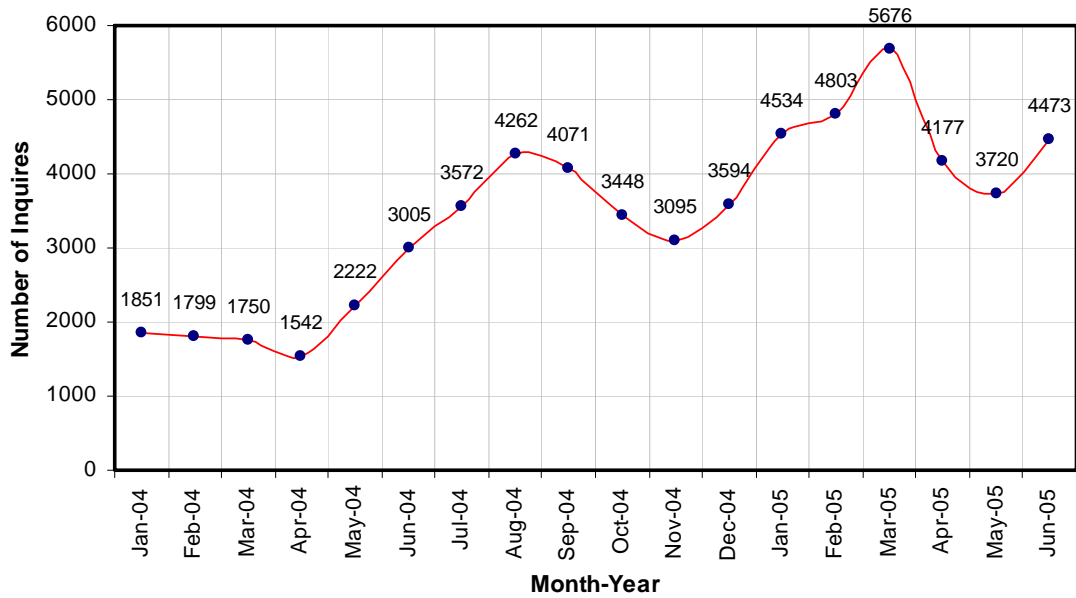


Figure 2. Number of individual PFDS data inquires per month.

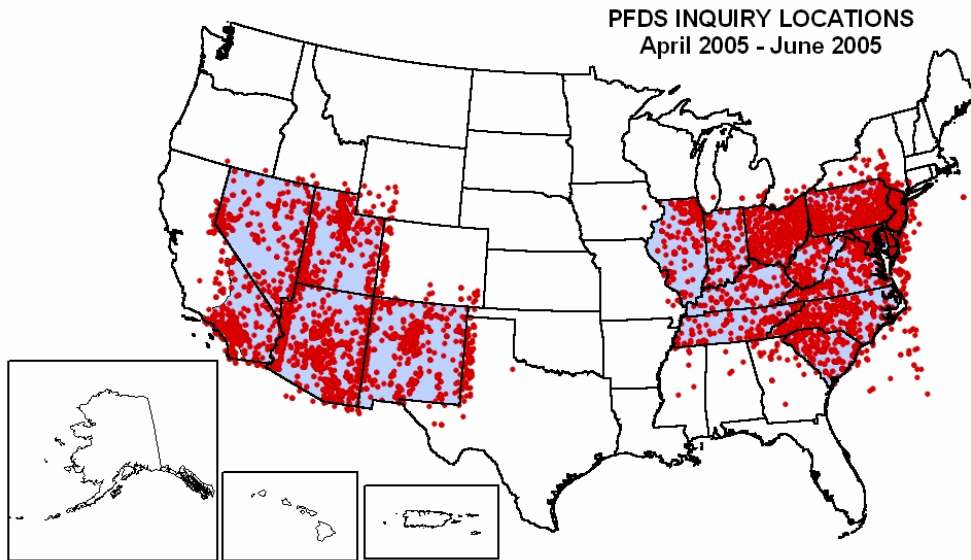


Figure 3. Map of 12,370 PFDS data inquiry locations during the period April-June 2005.



### 3.3 Areal Reduction Factors

Work continues in the development of geographically-fixed Areal Reduction Factor (ARF) curves for basin area sizes of 10 to 400 square miles. Progress has been slow due to difficulties in completing the software related to the addition of two durations (30-minutes and 48-hours). The use of Hydrometeorological Automated Data System (HADS) data is being investigated in order to supplement other precipitation data with the goal of possibly adding two basin sites (in the New York-New Jersey area and in Oklahoma) to the ARF study.

Two statistical and objective testing procedures, the sign test (Himmelblau, 1970) and a modified "student t" test (Siegel, 1961) will be applied to detect differences among the ARF curves at the various sites. Results of these tests on the data from two sites are being examined.

## 4. Issues

### 4.1 Funding Becomes Available for Fiscal Year 2005 (FY05)

Funding has become available for FY05 from the US Army Corps of Engineers (USACE) and NWS sources. However, funding from USACE is less than expected. Therefore, we anticipate work will begin on the Hawaii Precipitation Frequency Project in August 2005. However, funding for FY06 must be increased in order to meet the schedule set below.

### 4.2 Recent Award

On May 13<sup>th</sup>, 2005, Geoff Bonnin, Director of HDSC, was awarded the 2005 Administrator's Award from Conrad C. Lautenbacher, Jr., Vice Admiral, U.S. Navy (Ret.), Under Secretary of Commerce for Oceans and Atmosphere for "exceptional leadership in developing climatic precipitation information for engineering design standards for the nation's construction and insurance industry." The Administrator's Award is an extremely high level of recognition within NOAA. Mr. Bonnin's honor reflects the accomplishments of entire staff during the past few years.

### 4.3 1-year Precipitation Frequency

HDSC has been approached by the State of Maryland State Highway Administration (MDSHA) to calculate and include the 1-year average recurrence interval (ARI) precipitation frequency estimates for NOAA Atlas 14 Volume 2. Discussions are being held with MDSHA on funding and contractual mechanisms. We anticipate that the additional estimates will be computed for the entire Volume 2 domain as it is cheaper to perform this calculation than to segregate out a calculation for Maryland alone.

## 5. Projected Schedule and Remaining Tasks

The following list provides a tentative schedule with completion dates. Brief descriptions of tasks that will be worked on during the next few quarters are also included in this section.

Data Collection and Quality Control [November 2005]  
L-Moment Analysis/Frequency Distribution [March 2006]  
Trend Analysis [January 2006]  
Temporal Distributions of Extreme Rainfall [April 2006]  
Spatial Interpolation [June 2006]  
Peer Review of Spatially Distributed Estimates [July 2006]  
Precipitation Frequency Maps [September 2006]  
Web Publication [September 2006]

Areal Reduction Factors [September 2005]

### 5.1 Data Collection and Quality Control.

Starting in August 2005 we will obtain appropriate NCDC and other available data and then start the quality control and testing of the regionalization. The estimation of the appropriate probability distribution functions and the parameterization of these functions as well as the spatial interpolation steps will be done for all islands as a group to ensure consistency in this part of the process.

### 5.2 Areal Reduction Factors (ARF)

Computations for the ARF curves will be completed in the next quarter for 14 areas. The resulting curves will be tested for differences to determine if a single set of ARF curves is applicable to the entire U.S. or whether curves vary by region.

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